

PRECISION MEASUREMENT OF THE HIGGS BOSON MASS AND SEARCH FOR
DILEPTON MASS RESONANCES IN $H \rightarrow 4\ell$ DECAYS USING THE CMS DETECTOR AT
THE LHC

By

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A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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TABLE OF CONTENTS

	<u>page</u>
LIST OF TABLES.....	4
LIST OF FIGURES.....	5
ABSTRACT.....	6
CHAPTER	
REFERENCES.....	6

LIST OF TABLES

Tables

page

LIST OF FIGURES

Figures

page

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Chair: Andrey Korytov

Co-Chair: Guenakh Mitselmakher

Major: Physics

The mass of the Higgs boson is measured in the $H \rightarrow ZZ^* \rightarrow 4\ell$ decay channel (where ℓ is an electron or muon) and is found to be `TODO:MASS`—the world’s best measurement to date. The data for the measurement, which were obtained from proton-proton (pp) collisions produced by the Large Hadron Collider during Run 2 (2016–2018) at a center-of-mass energy of 13 TeV, were analyzed by the Compact Muon Solenoid experiment and correspond to an integrated luminosity of 137.1 fb^{-1} . The measurement uses an improved analysis technique in which the final state muon tracks are constrained to originate from the primary pp vertex. Using the same data sets, a search for low-mass dilepton resonances in Higgs boson decays to the 4ℓ final state is also conducted. No significant deviation from the standard model prediction is observed.

REFERENCES